HOT IDEAS FOR FRACTIONS

The Hot Ideas in this issue are contributed by a range of people. They are designed to help students to develop understandings of equivalence among fractions and of fractions as division.

Apple print halves and quarters — Ali Blair

Understanding the equivalence in relation to fractions is centrally important. Students need many experiences of flexibly combining simple fractions in ways that reinforce equivalences among them. Apples, or other fruit, divided in to halves and quarters can be used for making prints that clearly indicate the fraction of the apple that was used. Students can explore the range of ways in which a particular number can be made from halves and quarters, or simply experiment with different groups of prints and calculate the totals represented. Figures 1 to 3 are examples of apple fraction prints made by students in a grade 4–5 class.

Figure 1. Three ways of making 2

Figure 2. Making 1 and 2

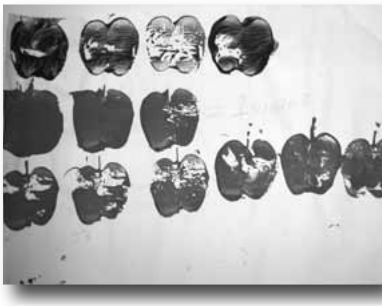

Figure 3. Exploring halves

The pie game — Helen and Rebecca in Grade 8, Ravenswood School for Girls

The game is illustrated here with halves, quarters and eighths but can be readily adapted to other fraction families. Figure 4 shows the game with a square pie and fractions labelled with symbols. The pie can be any shape and labels can be words. It is designed to be played by small groups of students.

1. Explain the rules of the pie game to the students.
2. Each player starts with a blank pie.
3. The first player chooses a card on which a fraction is represented.
4. The player selects the indicated fraction of the pie from the pile and puts it on his/her pie. For example, if the card said $\frac{1}{2}$ the player would go to the fraction pile and find a $\frac{1}{2}$ piece of pie.
5. Players take turns doing steps 4 and 5. The first person to fill up his/her pie wins.

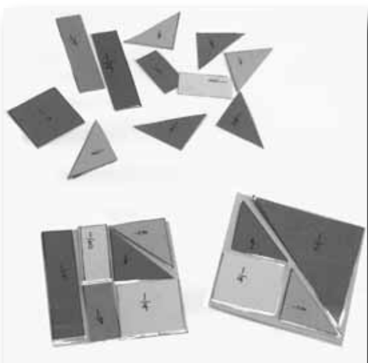

Figure 4. Pie game

Making wholes

Maddy and Melanie in Grade 8, Ravenswood School for Girls

This fraction game affords another opportunity for students to explore equivalence with fractions. It is illustrated with halves, quarters and eighths, but is readily adaptable to other fraction families. It is designed to be played in small groups.

1. Students are each given an identical card which represents a whole.
2. They then share out a collection of 8–32 pieces each of which is $\frac{1}{2}$, $\frac{1}{4}$ or $\frac{1}{8}$ of the whole, and prepared so that 4 complete wholes can be assembled. Each student is then given approximately 8 pieces with which they try and make a whole.
3. They can swap pieces with other students. Interesting differences in group dynamics can be observed by altering the rules about swapping. For example, only allow pieces to be offered, not taken, require the activity to be completed in silence.
4. The group is finished when the 4 wholes are assembled.
5. You may ask the students to record their combinations symbolically, for example:

$$\frac{1}{2}+\frac{1}{8}+\frac{1}{4}+\frac{1}{8}=1 \text{ whole}$$

Fraction as division [adapted from Clarke, D. (2006). Fractions as division. *APMC 11*(3), 4–9.]

The following activity looks at the notion of "fraction as division" or "fraction as quotient." Rather than seeing $\frac{2}{3}$ for example, as two parts out of three, the activity focuses on the meaning of $\frac{2}{3}$ as "2 divided by 3."

You will need: 3 chairs and a number of whole chocolate bars (illustrated here with 10).

1. Place the 3 chairs at the front of the class and distribute the chocolate on the chairs. In this case, 5, 3, and 2 chocolate bars respectively (see Figure 6).
2. Ask individuals one at a time to come up and choose a chair to stand behind, with a view to sharing the chocolate at the end of the activity ("more chocolate is better").
3. As more students are selected and make their choice, ask them to explain their reasoning. Also, ask other students to suggest where they think others should stand and why.

Valuable discussion can occur around the strategies that students use to make their decisions and at the end of the activity, the following questions can extend their thinking further:

- If, at the end, you had the choice to move to a different chair, would you do so?
- Where would you choose to stand in the queue? Is it best to go first or last?

Removing the chocolate from the packets involves further challenges, and instances where there are more blocks of chocolate than people provides a context for discussing improper fractions.

Finally, have the students behind one of the chairs lift it over their heads, with the chocolate still on it. Figure 7 shows a visual image of the numerator, denominator and vinculum of the fraction. In this instance, five blocks of chocolate on top, chair as vinculum (line dividing the numerator and denominator) and two people underneath, provides a powerful image of five over three, or $\frac{5}{3}$.

Figure 6. Which chair would you stand behind?

Figure 7. The numerator, vinculum and denominator